

1                                    CONTINUOUS ROOF TRUSS RESTRAINT

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3                    FIELD OF THE INVENTION

4                    This invention relates to construction materials used in  
5                    retaining roof trusses, and in particular to a continuous roof  
6                    truss restraint to accommodate high wind loads.

7

8                    BACKGROUND OF THE INVENTION

9                    Property damage frequently occurs when a structure is  
10                   exposed to wind gusts, down bursts, tornados, sustained high  
11                   winds, or the like. Some areas of the country are prone to  
12                   sustained high winds such as those produced from hurricanes.  
13                   Wind damage may cause the loss of personal property and life  
14                   should the roof of a structure be destroyed, exposing both the  
15                   building interior and its contents to the elements.

16                   Current building codes for hurricane prone areas include  
17                   roof restraints, commonly referred to as tie-downs or hurricane  
18                   straps. The tie-downs consist of thin metal straps extending  
19                   in a vertical format to connect a wall support member directly  
20                   to the truss support. In a similar construction technique,  
21                   walls formed from concrete employ the use of tie-down straps  
22                   with securement made in a vertical format between the concrete  
23                   wall and the roof truss directly above the concrete wall, by  
24                   use of nails or screw fasteners (Tapcons). Foam core

1 construction, capable of withstanding extremely high winds by  
2 use of a concrete coating, currently employ the same tie-down  
3 strap as used in other types of construction.

4 Tie-down straps typically require 6 to 8 fasteners in  
5 addition to those fasteners required to fasten the framing  
6 members together. The use of fasteners on the strap results in  
7 a load transfer directly from the roof truss to the vertical  
8 support below wherein loss of strength in the wall support can  
9 result in strap failure, as all of the strap fasteners may fail  
10 along the same alignment. For example, a tie-down strap may be  
11 two inches wide with the fasteners located along a parallel  
12 plane. Should a breach of the vertical support occur along the  
13 parallel plane, the holding strength of all the fasteners are  
14 compromised. Thus, if the single vertical support is weak, the  
15 tie-down strap is unable to distribute the loading horizontally  
16 and is not effective.

17 Further, tie-down straps are narrow strips of metal which  
18 do not prevent wind from passing between the straps. Thus,  
19 failure of a soffit may allow structural damage by allowing the  
20 environment to enter the structure. Once the wind is exposed  
21 to the interior of the structure, the uplift forces could be so  
22 great that the remaining tie-down straps can fail. Finally,  
23 current installation of tie-down straps is not consistent and  
24 the strength of which is partially dependent upon the skill of

1 the installer. A number of patents have been granted to  
2 address various aspects of tie-down strip problems.

3 U.S. Patent No. 5,390,460 discloses a roof securing system  
4 utilizing an elongated strap for reinforcing the attachment of  
5 underlying sheathing members to the truss structure of the  
6 roof.

7 U.S. Patent No. 5,722,212 discloses the use of retaining  
8 clips for roof tiles. This patent focuses on retention of the  
9 lower end of a shingle to prevent the shingle from lifting and  
10 being removed by heavy winds.

11 U.S. Patent No. 5,560,156 discloses a hurricane tie-down  
12 member formed from a planar saddle having a pair of side arm  
13 members and flat anchor surfaces. The saddle portion transfers  
14 upward forces to a vertical load bearing wall by the side arm  
15 members that terminate at their lower ends in flat anchor  
16 surfaces, which in turn are anchored to the vertical wall.

17 U.S. Patent No. 4,714,372 discloses a hurricane tie  
18 connector for wood frame construction which employs two plane  
19 tension connector bases upon a right angled triangular base  
20 member including a generally straight base edge and a generally  
21 straight truncated edge joined by an inside edge, a right  
22 angled triangular web member having a straight base edge and a  
23 truncated edge joined by an inside edge and joined to the base  
24 member along the inside edge.

1           Despite the of construction and the inherent securement of  
 2   roof trusses to the wall frame members, the ability to secure  
 3   a roof structure to a wall structure remains of unique concern.  
 4   This area of construction remains susceptible to failure should  
 5   high winds contact the cantilever overhang and either expose  
 6   the interior of the structure or weaken the vertical support  
 7   structure.

8           Thus, the prior art fails to provide a method or device  
 9   which provides a tie-down strap that distributes loading along  
 10   a horizontal plane and creates a wind barrier furthering a  
 11   roof's ability to withstand uplift forces along both the  
 12   exterior and interior walls.

1     SUMMARY OF THE INVENTION

2             The present invention is directed toward an apparatus and  
3     method of building construction which addresses the traditional  
4     framed wall and trussed roof construction and provides a  
5     construction technique that enhances storm and hurricane  
6     resistance. The apparatus is a structural member positionable  
7     between the vertical wall supports and the angled roof truss  
8     by use of a cap member placed along a horizontal plane to cover  
9     a plurality of vertical wall support members. An inner strap  
10    member is secured along a first side edge of the cap member and  
11    securable to the obtuse roof truss support along an opposite  
12    side edge. An outer strap member is secured along a second  
13    side edge and securable to the oblique roof truss support along  
14    an opposite side edge. The cap member and inner and outer  
15    strap creates a continuous tie down hurricane strap capable of  
16    preventing separation of the roof trusses from the vertical  
17    walls along the interior and exterior of the structure, and  
18    inhibit wind from entering between the straps. In effect, the  
19    apparatus provides a continuous restraint in a horizontal  
20    format. In an alternative embodiment, elements of the inner  
21    strap member, outer strap member, and cap member can be formed  
22    as a unitary structure wherein the inner strap member and outer  
23    strap member are integrally formed with the cap member.

24            The apparatus can be manufactured from a material selected

1 from the group consisting of aluminum, galvanized steel and  
2 plastic. The structural member provides an enhanced tensile  
3 load characteristics being effective to render the structure  
4 impervious to damage from winds in the range of about 155-310  
5 mph.

6  
7 Accordingly, it is an objective of the instant invention  
8 to teach a unique method of building construction utilizing a  
9 continuous tie-down strap capable of withstanding hurricane  
10 force winds.

11 It is a further objective of the invention is to teach a  
12 tie-down strap that provides a vertical wall header for use  
13 with panel interface construction capable of being made  
14 impervious to wind velocities in the range of about 155-310  
15 mph.

16 Another objective of the invention is to teach a tie-down  
17 apparatus that can be used on wood, metal, or concrete framed  
18 construction and can be covered with exterior coatings as it  
19 can be used as part of the framing structure instead of  
20 individual straps.

21 Still another objective of the invention is to teach the  
22 use of a tie-down apparatus that can be preassembled with inner  
23 and outer straps coupled to a cap member, or assembled at site  
24 where the inner and outer straps are coupled to the cap member

1 after the cap member is secured.

2 Another objective of the invention to disclose a  
3 horizontal disposed tie-down connector that further operates as  
4 a header.

1 Other objectives and advantages of this invention will  
2 become apparent from the following description taken in  
3 conjunction with the accompanying drawings wherein are set  
4 forth, by way of illustration and example, certain embodiments  
5 of this invention. The drawings constitute a part of this  
6 specification and include exemplary embodiments of the present  
7 invention and illustrate various objects and features thereof.

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1     BRIEF DESCRIPTION OF THE FIGURES

2             Figure 1 is perspective view illustrating multiple roof  
3     trusses and vertical support members secured to together by the  
4     continuous tie-down apparatus of the instant invention;

5             Figure 2 is cross-sectional view illustrating the  
6     continuous tie-down apparatus;

7             Figure 3 is a side view of the tie-down apparatus  
8     illustrated in Figure 2,

9             Figure 4 is a side view of an alternative embodiment fo  
10    the tie-down apparatus of the instant invention;

            Figure 5 is a perspective view of an alternative  
embodiment of the tie-down apparatus illustrated in Figure 4.



1     DETAILED DESCRIPTION OF THE INVENTION

2             With reference to Figure 1, a metal structure such as that  
3     found in a concrete foam structure patented by the instant  
4     inventor under U.S. Patent No. 6,185,891, the contents of which  
5     is incorporated herein by reference, employ rigid panels of  
6     environmentally sensitive rigid styrene foam placed within an  
7     underlying structure of wall members 10, 12 & 14 and roof  
8     members 16, 18 & 20. In such an embodiment, foam having a  
9     thickness of 8" is inserted between the wall and roof members  
10    during an assembly stage and multiple foam panels are  
11    adhesively engaged to each other at joints with a polyurethane  
12    adhesive or the like to form a rigid, adhesively engaged,  
13    sealed structure.

14            The tie-down apparatus of the instant invention can be  
15    formed into an integral part of the construction and consists  
16    of cap member 22 having a top surface 24 and downwardly  
17    depending side edges 26 and 28. The cap member 22 is placed  
18    over the upright wall members 10, 12 & 14 and secured thereto  
19    by rivet, screw, or the like fastener 30. It is reminded that  
20    this system can be applied to wood frame or cement block, or  
21    the like construction that current employ conventional tie-down  
22    straps. The cap member 22 maintains the wall members at a  
23    predetermined distance in the form of a header or tie beam  
24    allowing preassembly of walls.

The cap member 22 provides support for inner strap 32 having a sidewall 34 securable to sidewall member 26 by use of a fastener 30 previously described. The inner strap 32 includes an angled top portion 36 securable to the truss member 16, 18, and 20, the angled top portion 36 meeting the truss members at an obtuse angle. In this embodiment, the metal formed truss member 16 is formed into an I-beam shape by use of two C-shaped channels secured back to back. The truss member 16 is fastened 38 along the obtuse angle 36 formed between the supports by the previously mentioned fastening means 30. Similarly an outer strap 40 includes an angle 42 securable to the I-beam as depicted by numeral 44 on truss member 16 at the oblique angle presented. The outer strap 40 includes a downwardly depending member 46 for fastening directly to cap member 22 by the previously mentioned fastening means 30.

The assembly provides a cap member that prevents movement of the vertical supports 10,12, and 14 and by use of the inner and outer straps provide for a distribution of stress along a horizontal plane for the truss members 16, 18, and 20. The assembly further operates as a continuous strap for wind abatement by preventing air that may enter the soffit from passing between the truss members along the vertical supports, which would otherwise result in an upward lift to the roof. The inner strap 40 provides additional strength to the roof which

1 is not available with the single strap design. In addition,  
2 the use of a continuous strap along the interior wall prevents  
3 air from entering the backside of the assembly should  
4 structural damage occur to windows, wherein the inner portion  
5 of the structure otherwise exposed to high winds.

6 Referring to Figures 2 and 3, set forth is a perspective  
7 and side view of a single vertical beam 10, formed from C-  
8 channels 52 and 54, the beam 10 is secured to a foundation  
9 header 56 or directly to a foundation 56. The securement may  
10 include a lower tie-down strap 60 of conventional design. The  
11 cap member 22 is depicted with depending member 26 wherein  
12 sidewall 34 of inner strap 32 is attached thereto. The inner  
13 strap having an upper portion 36 formed along an obtuse angle  
14 that meets the pitch of the roof truss 16. Similarly outer  
15 strap 40 includes an outer angle portion 42 formed from an  
16 oblique angle that is also fastened to the truss member 16 with  
17 fasteners.

18 In an alternative embodiment, elements of the inner strap  
19 member, outer strap member, and cap member can be formed as a  
20 unitary structure. Figures 4 and 5 respectively illustrate a  
21 side and perspective view of an embodiment of the present  
22 invention in which the inner and outer straps are formed  
23 integral to the cap member, thus forming the roof restraint 62.  
24 The roof restraint 62 is a unitary structure which includes an

1 inner strap portion 75 and an outer strap portion 81 which are  
2 integrally formed with a horizontal cap portion 71. The roof  
3 restraint 62 is a continuous structure, similar to that shown  
4 in Fig. 1, which positionable over multiple vertical wall  
5 supports to create a continuous hurricane strap. The  
6 horizontal cap portion 71 has a first edge 85 and a second edge  
7 86 having a distance therebetween sufficient to span the width  
8 of the beam 10. The outer strap portion 81 is contiguous to  
9 horizontal cap portion 71 and depends downwardly from the  
10 second edge 86 at an angle equal to the pitch of the roof truss  
11 16. The inner strap portion 75 is contiguous to the first edge  
12 85 of the cap portion 71. The inner strap portion 75 has a  
13 first and second contiguous planar sections 87 and 88 meeting  
14 at a line of intersection 91. The first section 87 extends  
15 perpendicularly upward from the cap member and the second  
16 section 88 extends outwardly at an angle from the line of  
17 intersection 91 so as to be in alignment with the pitch of the  
18 roof truss 16. The inner strap portion 75 and outer strap  
19 portion 81 fastened to truss member 16 by fasteners 78 and 74.  
20 As best seen in the perspective view shown in Figure 5, the cap  
21 portion 71 is fastened by fasteners 64 to the I-beam 10.

22 It is to be understood that while a certain form of the  
23 invention is illustrated, it is not to be limited to the  
24 specific form or arrangement of parts herein described and

1 shown. It will be apparent to those skilled in the art that  
2 various changes may be made without departing from the scope of  
3 the invention and the invention is not to be considered limited  
4 to what is shown and described in the specification and  
5 drawings.

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